

Reach Out and Touch Someone: Romance of Interactivity
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And what is an artifact? Artificial intelligence research suggests ... An artifact can be thought of as a meeting point-an “interface” in today’s terms between an “inner” environment and an outer environment, the surrounding in which- it operates. If the inner environment is appropriate to the outer environment, or vice versa, the artifact will serve its intended purpose. (1)

-Pamela McCorduck

The current fascination with interactivity by avant-garde video is a beneficiary of 150 year old avant-garde ideas about form and content and the relatively recent computer revolution. A little over a hundred years ago artists produced painting and sculpture and the most common form of symbolic interactivity was letter writing. Then, the phrase “reach out and touch someone” with its shrill note of aggressive intimacy would probably have suggested to anyone hearing it that they should go and actually visit someone, perhaps bringing food and good cheer to a shut-in. Today, the phrase is part of the telephone company’s advertising campaign and everyone understands that the slogan means you should pick up a telephone and call someone. Increasingly, we live in a world where people are connected by an electronic interface. The current call for interactivity on the part of video artists is part of a larger societal development of machine-augmented simulacra of intimacy. Technology has shortened distances and accelerated communication so that widely separated individuals are no longer isolated and are now united in a global information net. Computer scientists and philosophers once dreamed of a world where people would be able to communicate with each other more effectively through machines than face to face. That dream is now a reality.

Whereas technology has created a new electronic community, it has also been part of the process that has witnessed the destruction of physical, social communities. Cars, airplanes, telephones, television, and computers have facilitated the decentralization of society. One kind of meeting has been substituted for another. In the late nineteenth century almost everyone played a musical instrument or sang, and people entertained themselves by playing music together. The phonograph and the radio brought a wide range of quality music and entertainment to a large audience but, in the process, has made public music making a rare experience primarily limited to professionals. Instead of the coffee Hatch, where neighborhood women would regularly meet around pine or Formica tables in each other’s kitchens, women now share their hopes and problems by talking to each other one to one on the telephone. The communality of an outing to a baseball game with its noises and smells and mass joy and sorrow has now been replaced by each person’s watching the game alone on television.

The telephone was introduced in 1876 and for the first time allowed people to be two places at once. Until fairly recently long-distance telephone calls were an exotic phenomenon and were only used in extreme circumstances such as a death in the family. I remember a time when it was

a daring, almost erotic experience to call a boyfriend long-distance instead of writing a letter simply because the kind of intimacy the telephone makes possible was not yet the everyday experience it has become and long-distance telephone calls were regarded as expensive, extravagant luxuries on a par with a dozen long-stemmed roses. Today, we have to use the telephone “to reach out and touch someone” because families are fractured into ever smaller units separated by vast geographical distances. Atlas Van Lines estimates typical corporate managers move fourteen times during their lifetimes. (2) Transience and isolation have become characteristics of suburban family life, and only 5 percent of American children see their grandparents on a regular basis. (3) Physical intimacy is being eclipsed by an ongoing dialogue between computers and humans that has already lead to a symbiotic, co-evolution that is central to artists’ dreams of interactivity.

Art

****A work of art is an externalization of the artist’s consciousness; as if we could see his way of seeing and not merely what he saw.

Whatever else art does it has to feed into an ongoing discourse on the nature of art, or we will judge it trivial. (4)

-Arthur C. Danto

Video art is the heir of the new set of assumptions in art, science, psychology, and literature about what constitutes reality that developed in the nineteenth century. This was a time marked by a revolution in consciousness as notions of hierarchical order as expressed in Renaissance perspective and the proscenium stage were replaced by a multiplicity of spatial and temporal points of view. The causal or parallel developments in mathematics (especially non-Euclidean geometry and the fourth dimension), physics (Einstein’s theory of relativity), and philosophy, and the invention of new forms of transportation and communication altered the previous linear and static perception of time and space to a simultaneous, fragmented, and conditional one. Based on developments in psychology from William James’s concept of “stream of consciousness” and Freud’s and other psychologists’ work on dreams and the unconscious, artists, in their works from the novels of Proust to Juan Downey’s *Thinking Eye* series of videotapes and Graham Weinbrun’s interactive videodisk project *The Erl King*, have structured their images into chains of interleaved fragments corresponding to these psychological models of reality and their own experience of the world. (5)

Many artists from Marcel Duchamp, Guillaume Apollinaire, and Jean Arp on wanted to reduce the total arbitrariness of their increasingly subjective visions and to renounce specific goals in favor of a “pervasive openness to new impressions” by giving over control of part of their compositions to “external arbitrary forms” (6) through the use of chance or aleatory composition. Chance allowed them to create open-ended structures that produced “a kind of chaos characteristic of nature.” It was also a device for bridging the gap between art and life because many like John Cage believed “art should not be different from life but an act within life. Like all of life, with its accidents and variety and disorder and only momentary beauty.” (7)

Recent computer studies have shown that use of chance in art only symbolically reduced the artist’s control by substituting one kind of order for another more limited one. McCorduck has noted that by “deliberately using chance, tossing a coin, we derive not uncertainty but a very

large measure of certainty that can not be achieved otherwise. Chance produces not only certainty but simplification.” (8) Artists’ reasons for using chance anticipate the new reality models (the mainstay of postmodern science), which are concerned with such things as “undecidables, the limits of precise control, conflicts characterized by incomplete information, ‘fracta,’ catastrophes, and pragmatic paradoxes.” (9) While denying us any sense of free will by showing us subject to unseen whirlpools of fate, mathematical theorems and computer modeling have shown that the nonlinear twists and wild disorder of chaos have their own structural logic, albeit one composed of infinitely spiraling subatomic coastlines of fractals.

Artists were prophetic in their understanding and acceptance of new mental and reality models. From cubism, surrealism, and the elaborate four-dimensional web of James Joyce’s *Ulysses* to the films of Stan Brakkage, Yvonne Rainer, and Anita Thacher, artists have created artifacts that humanized the new reality postulated by science and technology. Until recently, their work was limited to static and/or linear media such as painting, sculpture, literature, and even film, and they could only create simulations of their vision of a mutable, fragmentary world. It was not until the development of computers’ capacity for random access memory and the most complex interactive videodisks that they could fully realize their vision of a complex simultaneous web of images and ideas.

One of the consequences of these intellectual and technological developments was the shift from an external, Euclidean, and generally knowable reality to a more private subjective one. The avant-garde and the bourgeoisie took up opposing positions on consciousness. The creators of such bourgeois art forms as realistic painting and sculpture or Hollywood films asserted that their works represented *imitatio naturae* and were the true mimetic art forms. Building on new notions of science, psychology, literature, and art, the avant-garde argued that their private visions of and manipulations of form, color, and space constituted the true mimesis.

Avant-garde art has had a strange, aloof, and often hostile relationship with its audience. While avant-garde artists have sought to render a more authentic and universal depiction of reality through their use of abstraction and disjunction, their abandonment of a shared visual language based on the illusion of a harmonious reality offered by enclosed forms and logical narrative of Hollywood film, television, and realist painting for a personal vision has isolated them in an ivory-tower solipsism outside the praxis of society. Alienated from common discourse, they are left to communicate with a small group of like-minded people. Not even in the last quarter of the twentieth century when we live in a world of ever greater speed and the pulsating beat of MTV, a world in which people nightly create their own kaleidoscopic collages by flipping channels and playing the channel buttons on their cable boxes like a rocket jockey on -a race to the moon, is the artist’s subjective mosaic available to a general audience. One hundred years of experimental art has taught us it is one thing to experience the world as parallel and simultaneous fragments and it is another thing to be able to decipher another person’s nonlinear, kinetic tapestry. Placed in the position of being accidentally or deliberately an “outsider,” artists have sought to break down the separation between art and audience and art and life. They have adopted various strategies to make the audience part of the creative process. This is most striking in artists’ theater and performance throughout the twentieth century and the hybridization of art forms that occurred in the 1960s

At the end of the nineteenth century the illusionistic fourth wall of the theater was toppled and works by Alfred Jarry and Guillaume Apollinaire and others eliminated traditional distinctions between stage and audience with new and more environmental theater configurations. By the middle of the twentieth century happenings used all the available three-dimensional space, including that occupied by the spectator. In destroying theatrical conventions they anticipated the synesthesia of discotheques and the experience of participating in the mass spectacles from peace marches and rallies to rock concerts like Woodstock that characterized the late 1960s and early 1970s.

Marginalized by the hermeticism of their art and exempted from the needs of Hollywood films, Broadway musicals, and broadcast television to please an audience, some avant-garde artists decided that the opposite of pleasure was cruelty and assaulted their audiences. The futurists shouted at their audiences, bombarding them with noise and insults, and their audiences responded by petting them with eggs and tomatoes. Susan Sontag has pointed out that one of the key elements in Happenings was their assault on the audience:

***Perhaps the most striking feature of happenings is its treatment (this is the only word for it) of the audience. The performers may sprinkle water on the audience, or fling pennies or sneeze-producing detergent powder at it. Someone may be making near-deafening noises on an oil drum, or waving an acetylene torch in the direction of the spectators...There is no attempt to cater to the audience's desire to see everything...in fact it is often deliberately frustrated..." (10)

Sontag saw the avant-garde's deliberate withholding of information as another form of attack on the audience:

***The Happening operates by creating an asymmetrical network of surprises, without climax or consummation; this is the alogic of dreams rather than the logic of most art. Dreams have no sense of time...Lacking a plot and continuous rational discourse, they have no past. And this with-holding of a sense of structure is, if sublimated, as much an attack on the audience as the physical menace of the lawnmower. (11)

Nam June Paik's early music performances featured screaming, throwing beans at the audience, smashing glass, and other violent and aggressive acts to disturb the passivity of the audience. During Paik's 1959 *Etude for Pianoforte*, he jumped off the stage and cut off John Cage's tie. Cage said of Paik's concerts, "You get the feeling anything can happen even dangerous things." (12) Paik, Chris Burden, and other artists incorporated danger into their art to add a "climax" to indeterminate, nonhierarchical work that lacked an internal conclusion by putting both themselves and their audiences at risk.

Audience participation was an integral part of the art/theater/music works of the 1960s. This incorporation of the audience into the work of art and letting them shape it is an important precedent for the role of the viewer/participant in current interactive video disk projects. Cage rejected the notion that music was entertainment that was passively received by the audience. He wanted the audience to be participants (active listeners) who must "realize that they themselves are doing it, and not that something is done to them." (13) Along with other Fluxus composers, La Monte Young was fascinated by the audience as a social situation. Three of his 1960 compositions were ostensibly "audience pieces." In *Composition 1960 No. 3* listeners are told for a specific period of time or other they may do anything they wish. *No. 6* reverses the

performer/audience relationship-performers watch the audience in the same way as the audience usually watches the performers. Nonperformers are given the choice of watching or being the audience. (14)

The centrality of audience participation in Alan Kaprow's happenings and other work was extremely influential on later concepts of interactivity. Michael Kirby has defined three kinds of audience participation in Alan Kaprow's work: (15)

1. Pseudo participation, in which plants in the audience come on stage and take part in the work.
2. "Token" or "selected involvement," for example in Courtyard the audience is offered brooms and invited to sweep on stage. Only a few members of the audience took advantage of the offer, but the few People who did take part symbolically represented the audience's participation.
3. Pieces in which there were only participants-performers and accidental spectators.

To these three modes of audience participation, which are all found in current video disk projects, I would add a fourth, a variant of there being only participants, artworks in which the spectator is a necessary component of the work and completes it. In Michael Fried's 1967 essay, "Art and Objecthood," he observed that all work that does not have the "presentness and instantaneousness" of modern painting and sculpture tends toward theater, especially works like earthworks, and process art that extend into real time. (16) With some dismay he noted that instead of withdrawing into an aesthetic space, separate from that of the spectator, these works were clearly dependent on a situation in which the beholder of the works of art was actually their audience.

Many video sculptures and installations grew out of Fried's "theatricality." Paik's early video sculptures such as his 1965 *Magnet TV* and his later *Participation TV*'s required audience participation to change them from static forms to dynamic variable ones. Early closed-circuit video installations by Bruce Nauman, Keith Sonnier, Peter Campus, Dan Graham, and others used the instantaneous feedback of these systems to make the viewer an integral part of their work. In the late 1970s Buky Schwartz switched from abstract sculpture to closed-circuit video installations involving disparities between the appearance of three-dimensional objects in a room and how they appeared as two-dimensional shapes on the television screen as a way of deepening the viewer's involvement in the work and compressing the distance between the sculpture and the viewer. As Rosalind Krauss pointed out, these projects with their use of lived time put "pressure on the viewer's notion of *himself* as 'axiomatically coordinated'-as stable and unchanging in and for himself." (17) In speaking of audience participation it is important to distinguish between film and theater's collective audience where a group of people have a shared experience in a common public space and the idea of theatricality in sculpture in which the audience at any moment is essentially one person at a time. This sequential audience is identical to time-sharing in computer terms and the one-at-a-time interactivity of computers or video disks.

Video Art

***"Interface" originally came from the physical sciences, where it applied to events and properties peculiar to the boundaries between materials. The surface of the ocean, for instance, is an interface between air and water; and reactions occur there that do not occur in kind or quantity

anywhere else in the air-water system. An interface is an area where substance or energy is exchanged.

The term was adopted by the computer industry as being excellently descriptive of the juncture at which information is exchanged between two processes. An interface is whatever happens to be the medium of that exchange; a piece of equipment or a program that transfers information from one process to another. (18)

-Phil Berioni

The genesis of video art in the late 1960s was directly attributable to the introduction of low-cost, portable, 1/2-inch consumer-grade video equipment to the United States by Sony in 1968. The early black-and-white portapacks were a far cry from today's home equipment. A portable recorder, black-and-white camera and monitor cost between \$1,500 and \$2,000 dollars, about the same price as the comparable low-end equipment today, but the dollar was worth more then and the tape had to be threaded on an open reel. Also, the unit produced an unstable signal that was adequate in closed-circuit situations but was close to "junk" compared with broadcast television. In spite of these disadvantages, this ugly duckling immediately appealed to several constituencies that were virtually identical at the time: artists interested in new art materials, especially sculpture in an expanded field; technological or kinetic art; conceptual art; avant-garde film; and political activists. These groups eventually separated into several different camps-documentary, video installations, and video art. However, elements of the issues and ideas present at the initial nexus remained.

Video art was born at a time when the monolithic power of broadcast television as a mass communication and entertainment medium was being examined critically. As David Ross pointed out, "Television was no longer viewed as the activity of the culture, it was the culture." (19) Video artists came to their new medium with "seven channel childhoods." (20) Video art is more closely associated with broadcast television than a house painter is to Rembrandt. Not only do they share common tools and similar imagery and imaging systems, video art constantly compared itself to broadcast television and defined itself as being different from its jumbo elder relative while secretly yearning for a share of its power. Many video pioneers saw independent video as a revolutionary and utopian tool for giving power to the people and changing the world. "Video offered a means to decentralize television so that a Whitmanesque democracy of ideas, opinions and cultural expressions made both by and for the people" could correct the bias of broadcast television and enfranchise the disenfranchised. (21)

Almost a decade before Sony successfully introduced Betamax and Matsushita UVC and Panasonic) introduced VHS (Video Home System), the videocassettes and recorders that turned television audiences into active participants, artists were farseeing in their immediate understanding of implications of the half-inch revolution. As Erik Barnouw has pointed out, videotape has become "low cost . . . reuseable and could be expended . . . as freely as a novelist uses paper. Suddenly all sorts of people-alone or in schools, churches, groups and businesses-were in video production." (22) The compact, paperback-book-sized 1/2-inch cassette offered many new possibilities of distribution. Artists were among the first to realize the liberating aspects of the new format and sense its value as both a political tool and a new art form.

The late 1960s witnessed a massive redefinition of what constituted “art.” Many would have agreed with Paik, “There is no difference between ritual, classical, high art and low mass entertainment, and art. I *live*-whatever I like, I take.” (23) Artworks often consisted of activities and situations and incorporated time and space. Drawing on the tenets of conceptual and performance art, which emphasized using the materials of mass communication to disseminate art to a wider audience and the concept of art as information, artists wanted to compete with television on its own turf to challenge and ultimately usurp some of television’s ability to directly enter people’s lives. Television and radio were perceived as one-way sending mediums that were passively received by machines in individuals’ homes. Using symbolic actions, some video artists wanted to shake up the passivity of television audiences and make them aware of television’s limitations and possibilities.

In 1974, Douglas Davis broadcast three works on Austrian television. In all of these he addressed the audience directly saying, for example, “Please come to the set and place your lips against it. Think about our lips meeting now.” Davis described his goals at this time:

***I don’t hold with the performance aesthetic-that the art is only what happens to me. What happens to me is only a means of making contact with the viewer,, and with the world...{M}y first thought about the television set was to activate, as a link in a live sending as well as receiving link. We are almost blind to the two-way nature of television. Bertolt Brecht...correctly pointed out that the decision to manufacture radio sets as receivers only was a political decision, not an economic one. The same is true of television, it is a conscious (an unconscious) decision that renders it one way. My attempt was to inject two-way metaphors--via live telecasts-into our thinking process. (24)

Although calling for intimacy and interactivity, Davis’s projects underline the isolation and limitation of intimacy the electronic interface imposes.

Video artists were not content with showing their work in lofts, art galleries, and museums. They wanted to be “on the air.” The Television Labs at WGBH, WNET, and KQED provided early and substantial support both for the production and exhibition of artists’ television on their channels. The development of cable and low-power television in the mid sixties seemed to offer a chance for even greater access. In 1968 the Supreme Court gave the FCC the right to regulate the cable industry. In 1972 the FCC’s Cable Television Report ordered cable systems to have four different kinds of public access. To give this legislated “access” any real meaning, the cable facilities were required to provide low cost production facilities. This opened the door for artists. Soon video artists were asking, “How soon will artists have their own channels?” (25) There were many successful projects on cable television. These included the early TVTV (Top Value Television) and also Jaime Davidovich’s Cable Soho, which began in New York City in 1976 and the next year became the Artist’s Television Network. Another project also starting in 1976 was the Video Art show on Los Angeles, Theta Cable and Long Beach Cablevision. More recently, Paper Tiger Television in New York City has had a series on public-access cable television in New York City for seven years, examining the communications industry through a critical analysis of print media in a hard-hitting style that resembles aspects of performance art. None of these projects could be called truly interactive. In all of them the artists functioned primarily as senders on the same level of the many kinds of special-interest and personal programming that became a feature of cable television. Artists’ programming generally lacks both

the genuine interactivity of call-in radio shows and the less well-understood interactivity of broadcast television's audience. Broadcast television can be regarded as advertising interrupted by programs, and one way the broadcast audience interacts with television and determines what they watch is by buying or not buying the products that are advertised on the air. Artists' Television does not rely on the financial support of the audience to stay on the air, so interactivity with the audience is immaterial. The act of simply being on the air is enough to satisfy the concept of increased communication.

Some of the more radical developments in interactivity made possible by cable television were found in social services and grass roots democracy. In 1971, the Lister Hill Center for Biomedical Communications, National Library of Medicine under the direction of Dr. Harold Wooster built the New Hampshire-Vermont Interactive Network complete with a television studio at each site to allow doctors in rural Vermont and New Hampshire to participate in medical meetings long distance. The doctors could hear the papers but also participate in the question and answer period as if they were present in the room where the paper was given. Here, the necessity for knowledge causes the development of real interactivity whereas artistic projects, with a few exceptions, merely play lip service to it. The system is still in use today.

Soon after the communications satellites became available for private use, artists began to design projects that employed them. Douglas Davis's 1976 *Seven Thoughts* broadcast from the empty Houston Astrodome "to the global mind" is credited with being "the first attempt by an individual to use the global satellite in a personal way." (26) Most satellite projects—such as the ambitious interactive satellite teleconference *The Artist and Television* (1982), which interleaved performances and commentary in New York, Los Angeles, and Iowa City via the communications satellites West Star 3 and 4 and Sat Com3R—have focused on the artist's ability to be in several places at one time, the reconciliation of lost or "ghost" selves, and symbolic expressions of an expanded sense of "community." Only Kit Galloway and Sherrie Rabinowitz's *Hole in Space* (1980) extended their projects to a more liberal form of interactivity. Galloway and Rabinowitz set up a live satellite link between New York City and Los Angeles and, by placing large video screens in the street, provided a free videophone between the two cities. Many ordinary people spontaneously took advantage of the occasion to visit with friends and relatives on the other side of the continent. (27)

With the exception of Nam June Paik's *Good Morning Mr. Orwell* (1984), artists' satellite projects lack the polish of broadcast television. Their shoestring budgets impart a homemade, hand-touch quality that not only distinguishes art from industry but also reveals the fragile and artificial nature of the electronic mosaic of time and space made possible by the latest technology business. In all particulars they are virtually identical to teleconferencing or TV coverage of a global news event. The significance of the satellite projects lies less in their quality as good "art" and more in the fact artists managed to access commercial technology for the relay of personal and aesthetic information, thereby demystifying the hegemony of corporate technology, saying, If I can do it, you can do it.

A branch of twentieth-century art has always been interested in machines and a machine aesthetic that was an artistic response to new technologies and new ideas of perception. On a practical and theoretical level, groups such as the Raindance Foundation and publications such as

Radical Software and The Spaghetti City Video Manual sought to demystify the technology of television so that it was easily accessible. Many video artists were dedicated to achieving sufficient machine literacy to be able to use their tools effectively and imaginatively. A small group concentrated on video's soul and hardware, inventing new machines that, freed from television's constraint to generate recognizable universal product, produced new and often abstract images. Woody Vasulka has stated, "There is a certain property of the electronic image that is unique... [I]t's liquid, it's shapeable, it's clay, it's an art material, it exists independently," (28) These artists saw video's special properties as the basis for a new art form, the art form of the future. Along with Paik they believed, "As collage technique replaced oil paint, so the cathode ray tube will replace canvas." (29) Borrowing the ideas and terminology of computer programming, they began to think of these manifestations as a kind of language, and their work with video hardware as, in Vasulka's words, a "dialogue with the tool and the image, so we would not perceive an image separately... We would rather make a tool and dialogue with it." (30) This led to the development of new machines such as colorizers and synthesizers, which, in turn, affected the development of special effects generators used today in the television industry.

Video art's ongoing acceptance of the latest technologies has left it committed to exploring the cutting edge of an almost science-fiction vision of art. Because they are unfettered by the necessities of the marketplace, video artists are often the first to see an artistic application for technologies developed for information processing, storage and retrieval (computers), or communications advertising, and entertainment (television). Since the first years of the twentieth century, artists have produced visual expressions (artifacts) of how they felt about the way new technologies have changed time and space. In addition to producing artifacts, video artists frequently follow a model of production and creativity that more closely resembles that of science, especially the think tanks of computer science where research consists of "having ideas" and new projects are invented by imagining what might be possible from each new technological advance. (31) Video artists' ongoing involvement in exploring what machines can produce has led to the recent fascination with high-end technologies such as computer graphics, special effects and editing, and current experiments in interactive video disks. Video art is well on its way to losing its earlier democratic promise because high-end technologies are more expensive to produce than low-end ones. Only a few artists will receive the funding to complete interactive video disk projects from state and local arts agencies, limiting the possibility of artistic success to an elite few. The rarity and high cost of viewing mechanisms further limit the accessibility of interactive video disk projects because only a few places will be able to afford the elaborate, high-end & back mechanisms and only a small number of people will be able to have firsthand, hands-on experience of this new art form. Video art's current tango with interactive video disks puts the field in danger of falling into modern medicine's Catch 22, where limited resources are squandered on expensive, state-of-the-art equipment at the expense of more basic and needed health care because high-end equipment is more glamorous than spending money on nurse's salaries or bed-pans.

Computers and Artificial Intelligence

***Collections of facts, memories, perceptions, images, associations and predictions are the ingredients in our mental models, and in that sense, mental models are as individual as the people who formulate them. The essential privacy and variability of the models we construct in our

heads create the need to make external versions that can be perceived and agreed upon by others. (32)

-Howard Rheingold

The advent of each new technology potentially increases our ability to reach out and access an ever-widening world. Technology alters our picture of the world and fundamentally transforms us as well. Widespread literacy and the advent of printed books changed us from intuitive to analytical thinkers and expanded our ability to generalize and reason about cause and effect. (33) The development of computers in the post-World War II era has brought profound and far-reaching changes in our social interactions and our concept of the universe. Although it is possible to trace current involvement in interactive video disks as a new art form primarily to the history of avant-garde art and its aesthetics, many of the issues in contemporary art and life can be traced more directly to the evolution of computers and the structures and terminology necessary to facilitate relationships between people and machines.

In the late 1940s and early 1950s the air was buzzing with “new scientific ideas having to do with what had not yet been called information theory.” In a 1948 publication, “A Mathematical Model of Information,” Claude Shannon showed through a series of theorems that “any message can be transmitted with as high a reliability as one wishes, by devising the right code. The limit imposed by nature is concerned only with the limit of the communications channel.” (34) Howard Rheingold pointed out, “The key to life itself proved to be information theory . . . information- and communication-based models have proved enormously useful to the sciences because so many important phenomena can be seen in terms of messages. Human bodies can best be understood as complex communications networks than as clock-like machines.” (35) Norbert Wiener coined the term cybernetic, based on the Greek word for “steersman,” to describe the new field, and cybernetics were “the science or mechanism of maintaining order in a disorderly world.” (36)

It was less than thirty years ago when the term *interactive* was first used in reference to computers, and it was used to describe the then breathtaking but now humble function of being able to interrupt a computer run. Computers were primarily thought of as number crunchers in the 1950s, and programming consisted of converting information into boxes of cardboard cards punched with holes (IBM cards). These cards were “batch processed” by a computer the size of a room and you received a printout of the information several hours later. In the late 1950s, Dr. J.C.R. Licklider discovered while working on a mathematical or electronic model of the brain to simplify the task of understanding the complexities of the brain that he spent more time gathering information than using it. He began to imagine a sort of electronic servant who could take over these tasks and not only calculate but formulate models for him. In 1960 Licklider got to try out his ideas for the first time on the Digital Equipment Company’s new PDP-1 a minicomputer (a fast, compact computer the size of a refrigerator). Instead of “programming via boxes of punch cards over days,” the data could be feed into the machine by high-speed tape and it was possible to change the tape while the machine was running, “allowing the operator to interact with the machine for the first time.” (37) From this small beginning Licklider and others focused on interactivity as the way to achieve a partnership between people and computers that will produce computers capable of learning and, in Doug Engelbart’s words, “augmenting man’s intellect. (38)

It is not well known that the United States government has been in the information business since the late eighteenth century when the first patent act established a governmental committee to review and grant patents in 1790, and the Library of Congress was established in 1800. (39) In the 1950S the government was concerned with how the huge quantities of new technical information being generated could be quickly and easily available to increase our scientific and military capabilities. The Soviet Union's launch of Sputnik in 1957 made the government realize the inadequacies of the current system of information storage and retrieval. The Soviet Union's scientific prowess was attributed to the superiority of their educational system (Why Ivan can read and Johnny can't) and their All-Union Scientific Technical Information Apparatus, VINITI. The first reason spawned the 1958 Defense Education Act, which authorized a Science Information Service and Council in the National Science Foundation NSF. The same year the National Aeronautics and Space Agency was established and NSE established the Office of Science Information Service, OSIS. Beginning with the Baker Panel's 1958 report to President Eisenhower's Science Advisory Committee, which urged that a large research and development program in information sciences and technology be mounted by the federal government, some thirty-five studies, reports, and congressional hearings have attempted "to create VINITI-on-the-Potomac." The Department of Defense began to extensively fund both applied and basic work in the computer field. The development of greater interactivity was given priority because the ability to have a dialogue between user and computer increased the user's productivity and facilitated the development of ever more sophisticated machines and software.

In the days before personal computers, a significant obstacle to developing a fruitful human/computer symbiosis was the lack of easy and flexible access to computers. A key element of the development of interactive computing was the concept of time-sharing, computer systems capable of interacting with many programmers at the same time. Time-sharing gives each of 20, 30, or 1,000 people the illusion that he or she has the computer's exclusive attention, while the computer is actually switching from one user's task to another in tiny fractions of seconds. Programmers were able to submit their programs a piece at a time and receive their responses in the same way. By eliminating the wait and see" aspect of batch processing, time-sharing made it possible for programmers to treat their craft as a performing art." (40) The first time-sharing computers were primitive, but soon individual keyboards and simple forms of graphic display made interacting with computers more comfortable, or user friendly, a term coined in the 1980s.

In the late 1960s and the early 1970s the way individuals shared information in time-sharing communities (a group of people using the same central computer) was seen as a model for a global network of computers connected by common carriers (telephones) interacting freely with each other, united by a commonality of interest even before they existed.

**These new computer systems we are describing differ from other computer systems advertised with the same label: interactive, time sharing, multi-access. They differ by having a great deal of open-endedness, by rendering more service, and above all by providing facilities that foster a working sense of community among their users. (41)

It was believed that the dialogue caused by the free exchange of information would lead to the rapid development of new ideas because as Licklider and Taylor have pointed out, "When minds interact, new ideas emerge." (42) A few people realized that instead of being more democratic,

computers might simply substitute one kind of power for another and create a new subclass of people made up of those who did not have access to information.

**For the society, the impact will be good or bad depending mainly on the question: Will to be on line” be a privilege or a right? If only a favored section of the population gets a chance to enjoy the advantage of “intelligence amplification”, the network may exaggerate the discontinuity in the spectrum of intellectual opportunity . (43)

The utopian dream of a world united in an equalitarian web of free-flowing information has not materialized. The computer networks have become a reality, but the passage of the Mansfield Amendment in 1970, which stated the government could only spend money on research that had a direct military application, ended the days of free-form experimentation. As the government withdrew from the business of information and reduced or abolished the dissemination mechanisms and increased the cost for the information it continued to supply, the information business was taken over by the private sector. Unlike the public library system, which is equally accessible to rich and poor alike, there is always a user fee for computer information, and that information became a commodity that was bought and sold like any other. (44) Even in 1988, media philosophers like Gene Youngblood continued to imagine a world where global communications networks made possible by computers would allow people to communicate with each other freely. The reality is different. In our society power lies in the hands of those who control information, and since the government went out of the information business information is an expensive controlled substance. Aspects of computer networks have become an integral part of society from electronic mail to the folk culture that has sprung up around computer bulletin board systems and electronic magazines. (45) Even when the networks are used primarily for business, as they almost exclusively are, they also become vehicles of interpersonal exchange. As the movie *Jumping Jack Flash* clearly illustrated, it seems that whenever people are offered an opportunity to talk to each other, they take advantage of it to exchange ideas, sell a car, find a date, or just chat.

Fundamental to the evolution of the computer from a number-crunching tool to a dynamic medium for creative thought was the ability to talk to the computer in a version of human language rather than the programmers’ mathematical hieroglyphics. If you can type a command in simple English and receive a reply from the machine or it prompts you with a question, you feel as if you are dealing with a person and not a thing and this in turn fosters greater involvement with the computer. One of the first steps toward creating “a genuine language understanding program” was the program Joseph Weizenbaum created for ELIZA at MIT in 1964. This program and a later variant called DOCTOR mimicked human interaction and created the illusion of being “a wise, all knowing computerized psychiatrist.” The program encouraged people to talk to the machine by playing the users’ thoughts back to them. Weizenbaum was surprised that even sophisticated people “were drawn into conversations with the machine about their lives.” (46) The users’ belief that they are dealing with a responsive entity that they can communicate with in their own language has facilitated the widespread use of computers and the development of more complex forms of interactivity. Computers have gone from the most basic form of interactivity, INTERRUPTION to SELECTION, where the user can choose to do something; to the highest current form of interactivity, RESPONSIVENESS, where there is an exchange between users and computer (I do something, you do something). (47) Today,

high-end, “expert systems” tailor information to the user’s specific needs based on a conversation between the computer and its user.

Human beings are highly visual, and it was not until the first crude graphic display screens were introduced in the late 1960s that computers began to change our relationship to information and forge a new kind of space. Computers are largely based on the structure of the way the human brain processes information. It is one thing to understand that human memory is organized in lists and lists of lists cross-referenced by associations between them, and it is another thing to see that system on a screen “modeled not on pencils and printing presses but on how a human mind processes information. (48) The computer’s new “informationscape” presented a world atomized into relatively equal permutations and choices. Within this world, which is both real and not real, the user can freely rearrange that information and impose new structures on it or make it vanish. Seeing ideas as visual objects changes your view of the world because “when everything is visible: the display becomes the reality.” (49) Partially because of the way children were observed learning programming with the graphic displays of the LOGO system a greater emphasis was placed on developing interactive graphic displays. Scientists observed that the visual display of information psychologically created a better human machine interface, which in turn improved the quality of thinking and made the users more productive. With the advent of user-friendly personal computers, bank machines, computerized offices and schools, and electronic cottages in the 1980s, the experience of the world seen through the window of a computer is a commonplace one.

For most people the computer remained a tool for processing information until the video game fad of the 1970s demonstrated the computer’s ability to create external symbols and artifacts and actively engage people in their manipulation. While most of these new forms were primarily toys or games, many of the advances in artificial intelligence have occurred by watching how children learn by playing games. Games such as interactive fiction, which lie between play and literature, suggest the possibilities and drawbacks of aesthetic uses for computers’ responsive, branching structures. Interactive fiction promotes itself as “a whole new dimension in storytelling. Think of your favorite story. Now think of the main character in the story. And imagine YOU have become the character...The decisions are yours and so are the consequences...The plot unfolds as you decide what to do next, drawing you into a world so involving that it taps your adrenaline as much as your intellect.” (50) Interactive fiction does not live up to its promises. The stories are presented in a series of short blocks of text that appear on the screen. At frequent intervals the story is interrupted by a problem, danger, or puzzle for the viewer to solve. The player has to then step out of their identification with the characters and the story and type instructions on the screen in short phrases made up of the computer’s 700-word vocabulary like, “PICK UP THE STONE” or “KISS GEORGE” to which the computer may reply, “George takes you in his arms and kisses you. You soon discover he is as masterful at kissing as he is a swordsman . . .” or “I don’t know the word kiss.” (51) Depending on the viewer’s response to that dilemma, the story continues to the next problem or the player may be killed. The narrative stops if you cannot decide on an appropriate course of action. Interactive fiction offers neither the pleasure of being swept away given by watching a film or reading a book nor the joy of creating something new. But by breaking the story into paragraphs that must be interpreted by the viewer, interactive fiction presents a relationship to narrative different from that presented by conventional media (books and films), one that is more like critical exegesis than a video game like Space Invaders

or Pac-Man. Although viewers are ultimately trying to solve a puzzle by figuring out the game designer's mind, in the process they experience a world that is fragmented, conditional, and subject to their control, if only by their ability to turn the story off and on.

Novelist Thomas Disch has written an interactive novel, *Amnesia*, and his experience offers insights into the dynamics of interactivity as an art form and the resemblances and differences between designing a story to be experienced interactively and other forms of writing. He said that the processes of writing a novel and a work of interactive fiction were highly dissimilar. Interactive fiction is filled with stops and starts for both the writer and the reader. Unlike the streak of good writing that is the author's closest approximation of the entrancement the reader feels reading a book, the process of writing interactive fiction is extremely calculated, "like a tennis game in which the whole game has to be figured out in advance." (52) The narrative has to be written in small units of high-impact, vivid prose that is always "going toward overstatement." Every few screens the story has to be interrupted with "significant interactivity and then the story branches and then goes off in a wholly irrelevant direction."

Disch observed that the writer's relationship to the reader in interactive fiction is similar to that of a writer of a whodunit. In both genres the author is playing a game with the reader, and they both focus on manipulating the reader by trying to figure out what a clever person's response to a particular situation might be and stepping a little sideways and pulling the rug out from under their feet. Readers, he noticed, become involved in interactive stories in ways different from reading. They are often driven with a compulsion to finish the story and fill up the imaginary space the author has created by searching for the key to it, which the author has hidden like a grown-up's teasing a child by hiding candy in their closed fists. As long as readers cannot add new words to the story and change it, Disch has felt that the creativity of interactive fiction lies solely with the author. While acknowledging that interactive fiction in its present form is extremely limited, Disch imagined a future where puzzles and stories will be geared to your own psychology and then he said, "[T]he possibilities for vicarious involvement are total."

A drawback to seeing interactive fiction and other video games as a model for a possible future is their current sexual exclusivity. The vast majority of computer games are geared toward men, and interactive fiction is no exception. Most stories feature a male hero engaged in typical male genres of science fiction and action adventure stories. So far only Amy Briggs has written an interactive fiction that deals with a woman's genre, a romance and has a heroine as the main character. Except for these novelties, *Plundered Hearts* is identical in structure to other kinds of "interactive fiction." Yet, these changes in gender and genre did make some difference. I found myself instantly at home in the plot and liking the characters and becoming involved with them for the first time. Games from *Wizardry* to *The Leather Goddesses of Phobos* require the ability to create elaborate maps of the characters' journey. These maps involve an analytical relationship to an imaginary space that is more masculine than feminine in our culture. Perhaps this will change when learning how to use computers becomes as central a childhood experience as learning how to read, and the structures and imaginary space computers create will be available to everyone. Kristina Hooper of Apple Computers observed that when there was a computer available for every student, boys and girls were equally involved with them, but when there were not enough computers to go around, more boys than the girls used the computers. She also noted because of the different socialization of boys and girls, boys were more likely to be allowed to

become obsessed with computers, whereas girls were given less latitude for self-absorption and were expected to interact with people more and help around the house. (53) This means that boys tend to develop advanced computer skills by being allowed to play with them freely, whereas girls have less access to computers because of socialization and gender typing (girls aren't good at mathematics and machines) causing their computer literacy to lag behind.

From the time of Marcel Proust's *A la recherche du temps perdu* artists have created works of art expressing the mind's ability to wander and think of many things at the same time. Only recently has technology caught up. Recent developments in computer software such as Dynabooks, expert systems, and Hypercard have made it possible to duplicate the mind's "jumps and lands and flights of consciousness" (54) and "completely randomize your access to a body of data." (55) Computer theoreticians such as Brenda Laurel, formerly of Atari, have been working on programs that would let you experience *Hamlet* from six different points of view by being able to see the world through each of the characters' eyes. They see a world where the viewer can become an active participant in the story by being able to intervene in it and make decisions that affect the course of the story. The viewer would then become a creator who would be able to remake an imaginary world to satisfy his or her own needs and desires. As yet, that is not possible because it requires a marriage of three cultures: cinema, storytelling or narrative, and computers. Although not able yet to achieve this level of interactivity, video artists have begun to dream about it and make work based on its promise with the tools at hand.

Interactive VideoDisks

****Interactive processing** "Conversational" style real-time processing, wherein a user issues instructions and queries and the computer responds in a timely way, in many cases prompting or setting up further user queries or instructions. (56)

RAM (Random Access Memory)--A memory unit wherein one given location is as accessible as any other (unlike a serial access medium, a tape for example, where you must proceed through or past a series of elements to get to the elements of interest). (57)

-Phil Berton

Currently, video art is under the glamorous spell of interactive videodisks. In many ways interactivity is a chimera. Not only is it expensive to produce, but there are virtually no playback mechanisms available so that the few projects that have been completed are virtually impossible to see. The current romance of interactivity promises such things as being a better or more democratic art form and/or the art form of the future. Many of these siren songs are based on a false understanding of the term interactivity. The word interactive sounds like it will alleviate the alienation of modern life by generating a dynamic alliance between artists and their audiences, joining them together in a splendid waltz that lets viewers become equal partners with artists in creating art. Yet interactive videodisks do not empower the viewer to create a wholly new work with the materials they are given, and they only appear to eliminate the alienation of artist and viewer present in most avant-garde art. Finally, interactivity is primarily a computer term and has historically had specific and limited meanings based on the degrees of interface (58) between computers and people made possible by developments of computer hardware and software over the last thirty years.

At the same time Japanese engineers were developing "first one inch and half inch helical scan

recorders, then three quarter and half inch cassette recorders,” (59) American and European engineers were concentrated on videodisk technology in which visual information was stored on a disk like a phonograph record. When videodisk players were introduced in the 1970s, they were heralded as a revolutionary new advance in technology. Low-end players such as the pressure- transduction system jointly developed and marketed by Germany’s Telefunken Company and Britain’s Decca Company featured a limited, physical playing mechanism that employed a stylus like a phonograph needle. Each 8inch diameter disk only had ten minutes of material and a symphony or a movie required multiple disks. The high end, reflective disk systems jointly developed by MCA, which owns Universal Studios, and Phillips, the Dutch electronics firm, were another story. A reflective disk the size of an LP could hold a feature length movie or 100,000 or more separate frames in a nonperishable format. Visual information was laid down in concentric circles on the disk, and “the computerized, laser read videodisc player could” (60) either read the information linearly from the disk spinning at 1,800 RPM or if the arm was stopped over a single circular groove (equal to the two interlaced fields of one video frame) it could produce perfect freeze frames in an instant. When I first heard about videodisks in the late 1970s, I was fascinated by the idea that all of the slides I would need for a year of teaching art history could be available on a videodisk and instead of pulling slides from the drawers of the slide library and arranging them in carousels I could look at the disk’s index and type in the numbers of the slides I wanted for each class. Although Jerry Whiteley has recently finished a videodisk of the National Gallery of Art’s collection for Pioneer Video Disc and is currently working on a similar project for the Metropolitan Museum’s collection, both disks and players have so far remained too expensive to revolutionize college teaching.

Contrary to expectations videodisk players did not become the next musthave electronic appliance when they were introduced in the 1970s. They failed in their initial foray into the consumer market for various reasons: both disks and players were expensive, and although widely discussed in the trade press, not many of them were actually available; they offered only a playback function, and they were able to do something (play movies) that people did not yet know they wanted to be able to do. Videodisk manufacturers took a conservative wait-and-see attitude, while Betamax and VHS cassettes and recorders were introduced in 1975 and 1976 and aggressively marketed for their ability to give the viewer greater control/freedom by allowing viewers to record television programs off the air and time-shift them to a more convenient viewing time. After some initial consumer confusion over formats, with VHS becoming the popular favorite because it offered two hours of recording time versus Beta’s thirty minutes, 100,000 Beta and VHS recorders were sold in the first year and three years later over a million had been sold. (61) Videotape and the home VCR came to occupy the place manufacturers of videodisks had hoped their product would occupy because videotape is more flexible and democratic than videodisks are and because, by allowing viewers to assemble their own programming, videotape turned the television audience into active participants. Simultaneously, with the widespread acceptance of VCRs, the rental videotape market grew out of almost thin air to mammoth proportions by providing a new way for viewers to control and domesticate entertainment by renting almost brand-new movies and seeing them at home.

The recent proliferation of compact disks and compact disk players may create a new climate of acceptance for videodisk players. Although the majority of videodisk players permit only playback, a new format called W.O.R.M., write on once and record and play many times”

permits limited recording. In recent months several computer companies have introduced magneto-optical disk drives as a rival for hard disk drives in computers. These computers use a laser-read and written "optical storage system," (62) which allows the user to place information on a removable, erasable magneto-optical disk. just as compact disks store more information with a higher fidelity in a smaller space, magneto-optical discs make it possible to store a whole library of information on a single disk. It is possible to imagine a future in which videodisk players, CD players, and computers will all use the same format and be able to work in tandem, making subtle, interactive videodisk projects accessible to a wide audience.

It is important to understand that most of the interactivity of current videodisk players has been present in other electronic forms of entertainment. Retrospectively, we can see the degree of interactivity that already exists in the world. Traditionally, handling video artists' equipment has been taboo for the audience. One significant difference between current interactive videodisk projects and older video art is that interactive projects relinquish some of the artist's control and the audience is now permitted to touch the machines, something that may be an everyday experience at home, but up to now has been one of the distinguishing differences between public and private entertainment. These projects also offer the novelty of open-ended structures and multiple endings that are partially determined by the viewer.

An understanding of current videodisk system architecture reveals what is actually possible in an artistic use of this medium. Currently there are three levels of videodisk players and two different videodisk formats. Videodisks come in two different formats: Constant Linear Velocity (CLV) and Constant Angular Velocity (CAL) and each offers different advantages.

CLV disks are able to hold a large quantity of real-time information because the disks do not have to be uniformly formatted. Information is placed on the disk in concentric circles, rather than the graduated spiral of a phonograph record, and the whole surface is available to hold information. Each side holds approximately one hour of linear material, and a movie usually fits on two sides of the disk. Because of its high visual fidelity, many video artworks will be placed on these videodisks in the future, especially work that requires repeated play such as installations. CAL disks hold less information, but that information can be accessed in a more complex way. The disks have to be uniformly formatted so that the random access memory (RAM) of the videodisk player can locate each frame address. Uniform formatting can be visualized as fitting a square grid inside the circle of the disk and some of the space on the disk is lost this way. Other space is taken up by the extra information placed on the disk so the videodisk player can access the frames. Level II (level-two) and above videodisk players use the CAL format.

A level I (level-one) videodisk player is primarily a R.O.M. (read only memory) playback unit with the same level of interactivity possible with a home VCR. Interactivity at this level is a form of viewer-initiated interruption. Viewers can stop, start, and pause the tape/disk at their own volition. Games such as Penn and Teller's *Dirty Tricks for Dearest Friends* have been designed for videotapes with this degree of interactivity.

A level II (level-two) video player has an internal computer (CPU), which is operated by an external key pad. To access a frame or chapter, users press a search button on the key pad and

enter the number or chapter they wish to see. Level-two videodisks use the CAL format, and still images can be combined with brief real-time sequences such as documentaries or interviews. When the section is finished, it returns you to an on-screen menu. This level has been very successful in presenting art and training people to use forklift trucks or M-16 rifles.

In 1984, Lynn Hershman used a level II system in *Lorna*, generally credited as being the first artistic use of interactive videodisks. *Lorna* is a branching narrative about a 41-year-old woman with agoraphobia. At key plot points the viewer is allowed to choose the direction of the narrative from a series of options including three different endings for the story. Although all of the branching structures that interlock the various versions of the story together are predetermined, Hershman gives viewers the feeling that they are collaborating with the author in making decisions that affect the outcome of the story. Hershman feels handing the controls of the story to the viewer provides “a new area of individual freedom and empowerment.” (63) Because of the clarity of the narrative and the transparency of its structure, Hershman’s work speaks more to the potential of interactivity as a new, populist art form than do most other artists working in this medium.

A level III system multiplies the quantity and complexity of information that is available because it is controlled by an external computer (CPU) with a larger memory. Based on software and a wide range of possible input devices including touch screens, a mouse, or even sensors in your shoes, the computer translates the information (the signal) it receives from input devices to instructions (frame addresses) to one or more videodisk players. One way to understand the different levels of interactivity possible between level II and level III videodisk players is to compare how the National Gallery of Art videodisk functions differently in each kind of player. When the disk is used in a level II player viewers are offered an on-screen video catalog produced by Anne Marie Garry that allows them to choose which artist or work of art in the collection they want to see from Chapters 1-16, and frames 1-3,353. Using an external keypad you type in the number of the painting you want to see and the painting then appears on the screen. It may be accompanied by a brief, realtime documentary on the artist. Played in a level III system, you could do what has just been described, and in addition, you could select a painting, deliberately or at random. When the painting appeared on the screen, you would be asked to give it a name such as “lovers “ or “figure in a field.” Based on the painting and the name or category you supplied, the computer then offers you a group of similar works of art from the museum’s collection for your perusal. (64)

Using a level III system combining a Macintosh and a videodisk player, Jerry Whiteley and Andrew Phelan have produced an electronic version of Joseph Albers’s book, *The Interaction of Color* for Pratt Institute. Albers often stated COLOR IS THE MOST RELATIVE MEDIUM IN ART, and in his courses he assigned problems such as, “Make three colors look like four” or “Make warm colors look cool.” The interactive program graphically demonstrates these concepts and others. Whiteley and Phelan say the system is capable of producing 16 million variations of true color. While it is impossible for the human eye to distinguish all those colors, the project does offer a more dynamic experience than listening to a teacher or reading Albers’s book. The computer-generated colors are also richer and more complex than the clay-coated papers normally used by students to execute color theory assignments based on Albers’s teaching. (65)

In a world where the sum total of human knowledge has doubled in the last five years, the most common usage of interactive videodisks is informative and/or instructional. Ordinarily, videodisks are used to customize information on a one-on-one basis. The viewer is given a menu or decision screen listing options, and manually or verbally the viewer selects the information they want to know. In subsequent screens they are led from general to specific, detailed information by their choices. At any point they can choose to go ahead or return to the beginning. Ideally, the goal of the interactive videodisk designer (66) is to make the structure underlying the progression of choices transparent to the viewer. Leo Steinberg has pointed out that unlike the clear, direct message of a street sign, one of the qualities of great art is its ambiguity. When artists use interactive videodisks as an art form, they bring a different system of goals and values to its use. A technology that has up to now been primarily used for the semi-customized transfer of information visually in a clear, easily understood manner has become subjective and opaque in the hands of artists.

While offering brave new worlds, the new technology is a different and often more demanding mistress than either single-channel tapes or video installations. There is a big difference between offering the viewer an opportunity to experience the artist's personal vision of the world as a variable mosaic and the backstage work necessary to create. Instead of just creating images and editing them into linear sequences that are permanently fixed, the artist must now either alone or working with a computer programmer design complex branching structures that up to now have been the province of computer scientists to interlink multiple stories into a mutable electronic web that is open to change by the viewer.

Artists like Juan Downey are drawn to interactive videodisks because they allow them to express a fragmented, disjunctive vision of reality that they previously had to approximate in linear forms such as the single-channel videotapes of Downey's *Thinking Eye* series. For Downey, interactivity opens up the potential of storytelling. Unlike a single-channel videotape, which is physically linear, he no longer has to compose an artificial spine for interactive videodisks and make either/or editing decisions about the placement of material. The RAM memory of videodisks allows him to have both/and in a kind of narrative structure he first experienced in the layered and open-ended narratives of Latin American authors such as Borges, and *Hopscotch*, an interactive novel by Julio Cortazar that was the basis for Antonioni's movie *Blow-Up*. Most computer programmers describe the design of an interactive videodisk as being like a branching tree. Downey has visualized his narratives as rhizomic structures resembling the way potatoes and strawberries grow. "Every unit or module of the story is the whole story and if you have more than one you have a network." (67)

Downey looks forward to a time when he can do a melodrama based on six characters' variable, interlocking triangular relationships on videodisk in which the viewer or chance determines who kills whom, but *J.S. Bach* (1978), his first videodisk project, has limited level II interactivity. Side one of the disk is his single-channel biography of J. S. Bach. It's divided into chapters that could be watched in any order the viewer chooses, but there is no reason to restructure Downey's already idiosyncratic, fractured biography. Downey explored several ways to use interactivity on the second side of the disc. He found himself repeatedly drawn to the fugue, a musical form featuring short subjects or themes that are varied and played against each other. The second side of the disk offers "fourteen versions or possible ways of interpreting Bach's Fugue #24 for three

voices and harpsichord. These choices include hearing Elaine Comparonb, the harpsichord player, playing it through alone or each of the voices alone or in combination with other voices as well as upside down and backwards.” (68) An on-screen menu lets viewers choose which one they want to hear. Downey has acknowledged that interactivity does not democratize media and that the viewer/player only has the illusion of choice. In *J.S. Bach*, the extended artistic control interactivity offers gave him an opportunity to share his personal enjoyment of listening to counterpoint and allows the viewer to briefly experience the world through his eyes and ears.

Grahame Weinbrun and Roberta Friedman’s *The Erl King* is the only level III project to be completed to date. Weinbrun has seen *The Erl King* as being about “a relationship with a machine. The machine imposes certain forms. It tells you what it wants in a way that conventional media doesn’t.” (69) His goal was to find “images that are conglomerates of not necessarily consistent theme and then letting the apparatus make the viewer aware of the interlocking elements.” (70) Using the structure of dreams and “the way the mind can coalesce different lines of thought, images, beliefs, desires and memories into a single image,” Weinbrun and Friedman have combined an updated version of Schubert’s lied *Erlkoenig*, a fairy tale about a father who would not listen to his son’s fear of the evil king, and about his three daughters, and “The Burning Child” from Freud’s *The Interpretation of Dreams*, another story of a father’s failure to pay attention to his son’s premonition of danger. Using three videodisk players controlled by a microcomputer and software designed by the team, the viewer can touch the screen at any moment and the story will branch to a relevant tangent, allegory, metaphor, or commentary. Shot in 16mm film, the mise-en-scenes have a rich sumptuous surface like a tapestry that constantly shifts from figure to ground—a living person becomes a bust on a shelf, a myth becomes real.

Weinbrun and Friedman’s project is both the most complex to date and the most opaque. The viewer has to explore *The Erl King*’s structure or lack of it by exploring what they are given, a journey made more difficult by the lack of any of the conventional hooks to guarantee viewer involvement such as wanting to know how the story comes out or solving a puzzle or beating a machine playing a game. Since there are no right or wrong decisions, no past or present and Weinbrun and Friedman have supplied all the elements and have created the pathways linking them, ultimately *The Erl King* is about the experience of the world as a series of permutations. Although very beautiful, this kind of abstract, open-ended video project will only appeal to a very small group of people.

From using bank machines to being able to participate in choosing the name of the new baby on the nighttime soap opera *Santa Barbara*, or deciding whether Robin lives or dies in the first interactive comic books, a certain level of interactivity has become normal in our society. Is it logical to predict a future in which entertainment and art are primarily participatory and interactive based on the evidence of expanded interactivity in our society? I wonder. The single greatest change in American life, especially family life, over the last forty years, I might argue, has not been computers but the increased number of women earning money. Where once it took one salary to achieve our parents’ standard of living, it now takes two salaries, not to surpass them but merely to remain at the same level. In 1950 only 12 percent of married women with preschoolers worked. Between 1960 and 1972 “the number of mothers of children five and under who worked outside the home tripled,” and today, nearly half of all children under the age of six have a mother in the work force. (71) In a world where simultaneously you may be getting ready

to go to work; the baby-sitter is late; the phone rings; the dog grabs your sandwich from the counter; the baby cries; a siren is heard outside; you are worrying about whether you can make your mortgage payment this month and whether your mother will survive her operation scheduled for tomorrow, there is such a thing as too much excitement and activity. I question whether people, especially women, will have the time or inclination to enjoy the luxury of creating their own stories. Soap operas and regular series such as *Star Trek* or *Family Ties* are popular because they allow you to get to know the characters in time just as we get to know real people, but without all the hassles. The characters' ups and downs become part of your life, especially when seen on a daily basis, but unlike your family's or friends' problems, they do not directly affect you. Watching the ongoing stories of soap operas and regular series unfold at a certain time every day or week supplies a sense of constancy and order in otherwise chaotic times.

I can imagine a world like the one described in Ray Bradbury's 1953 science-fiction classic *Fahrenheit 451* where the electronic "parlor walls" showing an ongoing soap opera surround the viewer and parts are written into the show for the viewer at home who interacts with the characters by filling in the missing bits of dialogue.

***“(T)his is a play (that) comes on the wall-to-wall circuit in ten minutes. They mailed me my part this morning. I sent in some boxtops. They write the play with one part missing...The homemaker, that's me, is the missing part. When it comes time for the missing lines, they all look at me out of the three walls... Here, for instance, the man says, 'What do you think of this whole idea, Helen?' (72)

You might also be able to rent the interactive equivalent of a photo-novella which would allow you to alter the relationships between the characters and choose your own endings and make Rhett Butler give a damn. Yet, I doubt if, in the near future, people will be able to spend the concentrated, self-absorbed time necessary to fully engage in this kind of work.

What might really happen now that we are no longer tourists in McLuhan's global village and Orwell's 1984 has come and gone? In the near future computers will definitely be able to learn the way you think and act and intuit what we need based on that information, somewhat like the perfect nineteenth-century servant. As a friend pointed out, "anything that intuitively down to this level of interactivity is potentially addictive and dangerous and whether that is good or horrible depends on who controls it." (73) Similar technologies could be used for a fantasy amplifier that creates customized stories based on what it has learned about you. "Every spectator would be in conversation with the spectacle," (74) and you would participate in a story that changed according to your actions. What is the artists' role in this? Although many video artists are committed to incorporating the principle of interactivity and viewer involvement in their work, most artists' video continues to be a personal vision that is not readily accessible to a general audience because of the opacity of its structures. Most uses of interactivity will probably be confined to mass-market populist entertainment like soap operas, and rigidly controlled by media merchants because the cost of producing them will be very high, and only "stories" that appeal to a wide audience will be profitable. The artist's role will remain what it has always been, going boldly where no one has been before, being the first to see the artistic potential of new technologies and, as Nam June Paik said in 1969, "The real issue is not to make another scientific toy, but how to humanize the technology and the electronic medium . . . and also,

stimulate viewers' fantasy to look for the new, imaginative and humanist ways of using technology." (75)

1. Pamela McCorduck, *The Universal Mind* (New York: McGraw Hill, 1985), P. 280.
2. Steven Mintz and Susan Kellogg, *Domestic Revolutions-A Social History of American Family Life* (New York/London: Free Press, 1988), p. 185.
3. Ibid., P. 2 18.
4. Arthur C. Danto, quoted in Pamela McCorduck, *The Universal Mind*, p. 128.
5. For a more complete discussion, see the author's "Why Don't They Tell Stories Like They Use To?" *College Art Journal* (Fall, 1985), pp. 204-212
6. Peter Burger, *The Theory of the Avant Garde*, trans. Michael Shaw, (Minneapolis: Univ. of Minneapolis Press, 1984), p. 67.
7. John Cage, quoted in Martin Duberman, *Black Mountain* (Garden City, N.Y.: Dutton, 1973), P- 369.
8. McCorduck, *The Universal Mind*, P. 250
9. Jean-Francois Lyotard, *The Postmodern Condition: A Report on Knowledge*, trans. Geoff Bennington and Brian Massumi (Minneapolis: Univ. of Minnesota Press, 1984), p. 60.
10. Susan Sontag, *Against Interpretation*, 1967, quoted in Rosalind Krauss, *Passages in Modern Sculpture* (Cambridge: MIT Press, 1977).
11. Sontag, in Krauss, *Passages*, P. 232. At the conclusion of Alan Kaprow's, *A Spring Happening*. March 1961, at the Reuben Gallery, the audience was driven out of the gallery by someone operating a power lawnmower.
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13. Michael Nyman, *Experimental Music* (New York: 1974), P. 2 1.
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15. Michael Kirby, *The Art of Time* (New York: E.P. Dutton, 1969), pp. 160-65.
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17. Krauss, *Passages*, P. 240.
18. Phil Berton, *Strangers in Computerland* (New York: Vintage Books, 1984), P. 31.
19. David Ross, "A Provisional Overview of Artists' Television in the U.S.," *New Artists Video*, ed. Gregory Battcock (New York: E.P. Dutton, 1978), P. 139.
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21. Deirdre Boyle, "Subject to Change: Guerrilla Television Revisited," *Art Journal* (Fall 1985), P. 229.
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24. Douglas Davis, interviewed by Davis Ross, *Flash Art*, nos.54-55 (May 1975).
25. Nam June Paik, quoted by Ross, "A Provisional Overview of Artists' Television in the United States." *Studio International* no. 191 (May June 1976), p. 140.
26. Douglas Davis, *Arbeiten/Works 1970-1977* (Berlin, 1978), p. 96.
27. Lucinda Furlong, "Electronic Backtalk The Art of Interactive Video," *The Independent* (May 1988), p. 18.

28. Woody Vasulka in Lucinda Furlong, "Tracking Video Art: Image Processing as a Genre," *Art Journal* 45 (Fall 1985), P. 233.
29. Nam June Paik, in *Video n' Videology*, ed. Judson Rosebush (Syracuse: Everson Museum
30. Vasulka in Furlong, "Tracking Video Art: Image Processing as a Genre."
31. P. B. Medawar, in Jean-Francois Lyotard, *The Postmodern Condition: A Report on Knowledge*, trans. Geoff Bennington and Brian Massumi (Minneapolis: Univ. of Minnesota Press, 1984), p. 60.
32. Howard Rheingold, *Tools for Thought* (New York: Simon and Schuster, 1985), P. 215.
33. Pamela McCorduck, *The Universal Mind*. P. 31.
34. Rheingold,
35. Ibid., p. 126.
36. Ibid.. p. 112.
37. Ibid., p. 136.
38. Ibid., p. 182.
39. Information in this paragraph was presented by Harold Wooster, "Shining Palaces, Shifting Sands: National Information Systems," originally delivered as a speech, "Some Funny Things Happened on the Way to 1984," given at the meeting of the American Society for Information Science, 47th Annual Meeting, Philadelphia, October 22, 1984.
40. Rheingold, *Tools for Thought*, P. 211.
41. J.C.R. Licklider and R. Taylor, "The Computer as a Communication Device," April 1968, quoted in Rheingold, *Tools for Thought*, pp. 218-19.
42. Ibid., P. 214.
43. Ibid., P. 220.
44. Anne A. Armstrong, "The Information War," editorial in *ASIS Bulletin* (April 1982), quoted in Harold Wooster, "Shining Palaces."
45. Margia Kramer's three-channel installation and single-channel videotape Progress (Memory) (1983-84) offers one of the best discussions of computer culture and counterculture.
46. Rheingold, *Tools for Thought*, P. 21 1.
47. Remarks made by Kristina Hooper, cognitive psychologist and senior researcher and engineer at Apple Computers, Inc., at the symposium Continuity and Interruption (The Aesthetic Implications of Interactive Video), The Kitchen, New York City, January 17, 1988.
48. McCorduck, *The Universal Mind*, P 31.
49. Rheingold, *Tools for Thought*, P. 228.
50. *The Master Story Tellers*, Infocom Interactive Fiction Product Catalog, 1987.
51. Instruction manual for *Plundered Hearts*, Infocom, 1987.
52. Quotations in this and the next paragraph are from statements by Thomas Disch made in a telephone conversation with the author, December 1988.
53. Based on Kristina Hooper's response to the author's question at the symposium Continuity and Interruption (see n. 47).
54. Hooper, Continuity and Interruption.
55. Gene Youngblood at Continuity and Interruption.
56. Phil Bertom, *Strangers in Computerland* (New York: Vintage Books, 1984), P. 241.
57. Ibid., P. 242.
58. Kristina Hooper (see n. 47), described the three levels of computer interactivity as INTERRUPTION, SELECTION, and RESPONSIVENESS in remarks made as a panelist at the symposium.

59. Stuart M. DeLuca, *Television's Transformation: The Next 25 Years* (San Diego and New York: 1980), P. 258. 60. Eric Barnouw, *Tube of Plenty*, (London: Oxford Univ. Press, 1975), P. 496.
61. John Markoff, "The PC's Broad New Potential," *The New York Times*, November 30, 1988, pp. D1 and D8.
62. Lynn Hershman quoted in Lucinda Furlong, "Electronic Backtalk: The Art of Interactive Video," *The Independent*. May 1988, p. 18, from Christine Tamblyn, "Lynn Hershman's Narrative Anti-Narrative," *Afterimage* (Summer 1986), pp. 8-10.
63. The description of the National Gallery of Art videodisk used in a level III player is based on Juan Downey's experience and was told to the author in a telephone conversation, December 1988.
64. Jerry Whiteley and Andrew Phelan's *Interaction of Color* was shown at the Guggenheim Museum, New York as part of Joseph Albers: A Retrospective. March 25-May 29, 1988.
65. Based on remarks made by Steven Meyer, one of the technical designers of Edwin Schlossberg, Inc.'s interactive videodisk system for the World Financial Center, New York City, in a telephone conversation with the author in December 1988.
66. Juan Downey in a telephone conversation with the author, December 1988.
67. Ibid.
68. Ibid.
69. Grahame Weinbrun, in remarks made at the symposium Continuity and Interruption.
70. Grahame Weinbrun quoted in Furlong, "Electronic Backtalk," *Afterimage*, P. 20.
71. Steven Mintz and Susan Kellogg, *Domestic Revolutions-A Social History of American Family Life* (New York: Macmillan, 1988), pp. 218, 22.
72. Ray Bradbury, *Fahrenheit 451* (New York: Ballantine, 1953 and 1979), P. 21
73. Meyer conversation.
74. Gene Youngblood at the symposium Continuity and Interruption.
75. Nam June Paik/Charlotte Moorman, "TV Bra for Living Sculpture," (1969) in "Video, Vidiot, Videology" in *New Artists Video*, ed. Gregory Battcock (New York: E.P. Dutton 1978), P. 129